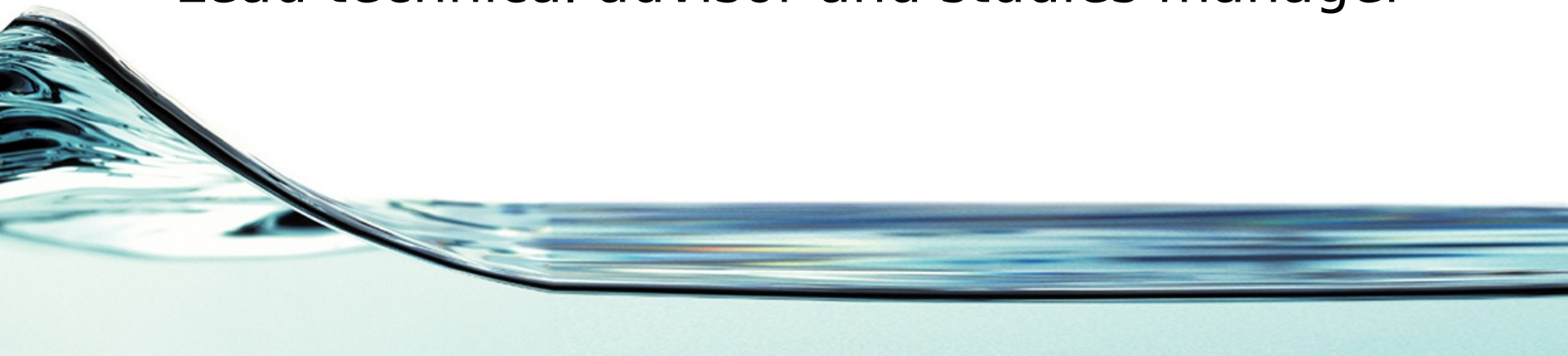


Key Messages for Policy Makers and Elected Officials

Edward Evans

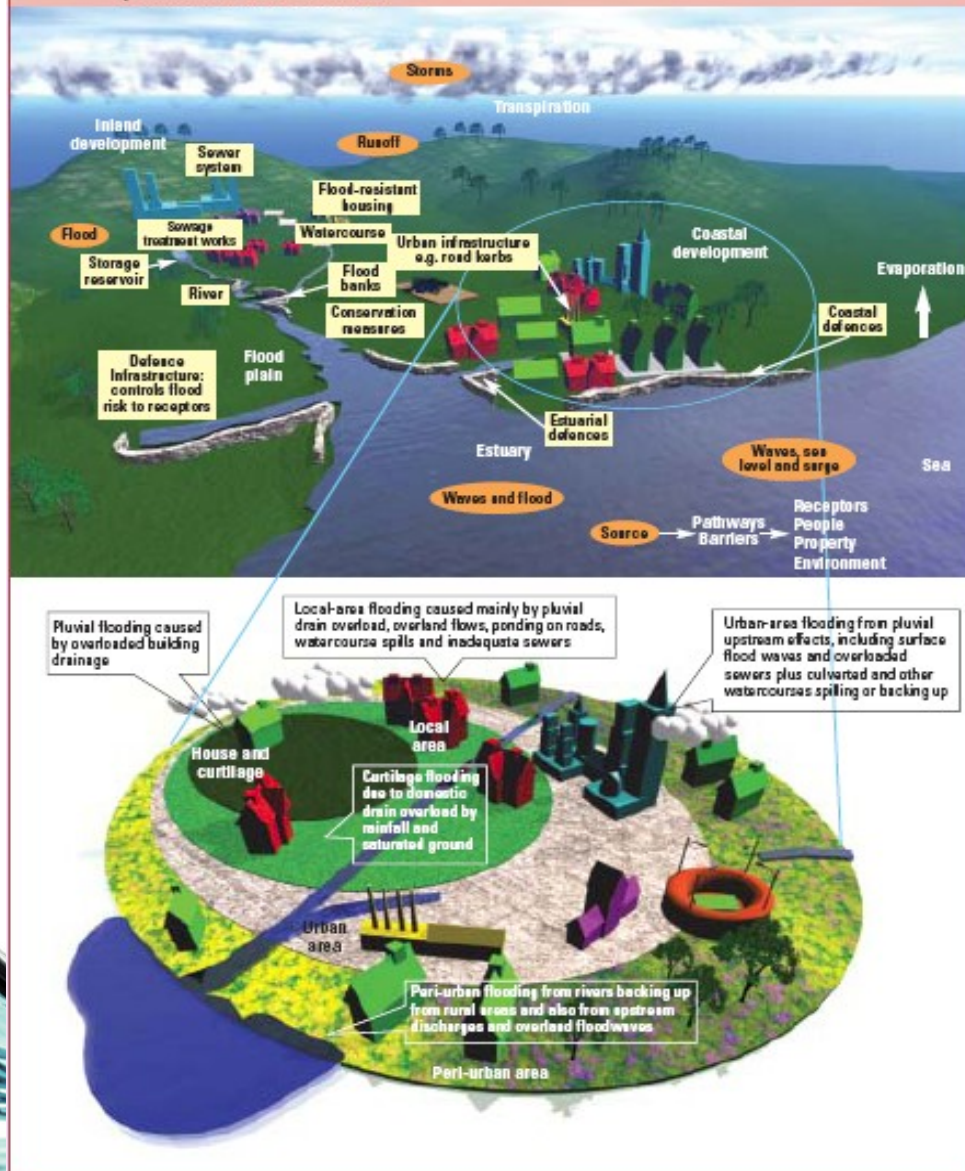
Lead technical advisor and studies manager



Assessing future flood risk and its drivers



Figure 1.1 A hydraulic perspective of the physical flooding system, illustrating the nesting of urban systems within the catchment



There are actually 2 flooding systems.

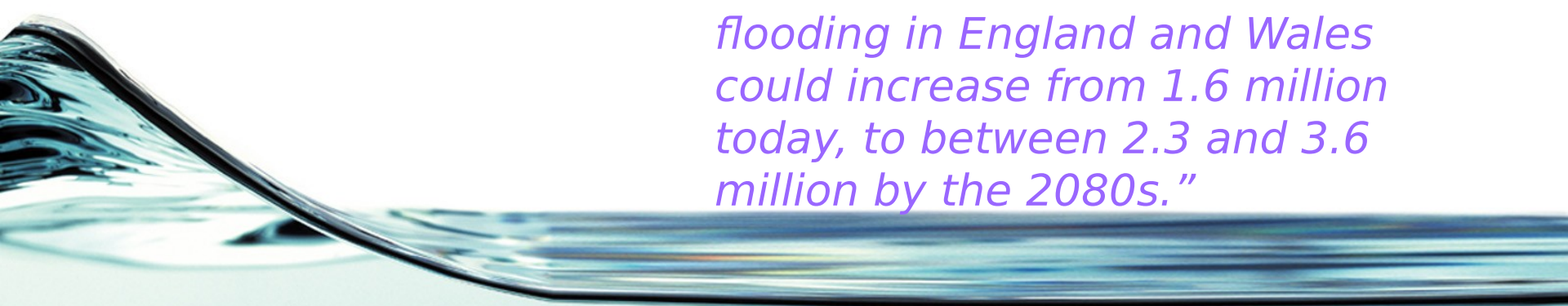
The 'intra-urban' is also very important and a lot less understood

Business as usual - Baseline risks for the UK now and in the 2080s (catchment and coastal)

Flood risks expressed as Expected Annual Damage (EAD) and the baseline costs of flood defence for the business as usual option (continuation of current flood-management policies and expenditure into the future) – catchment and coastal

	Present day	World Markets	National Enterprise	Local Stewardship	Global Sustainability
Baseline case, EAD £ million/year	1,040	20,500	15,100	1,500	4,860
Baseline cost £ million/year	500	500	500	500	500

“The number of people at high risk from river and coastal flooding in England and Wales could increase from 1.6 million today, to between 2.3 and 3.6 million by the 2080s.”



Business as usual - Baseline risks for the UK now and in the 2080s (intra-urban)

*Big rises in risk
inside towns and
cities*

Table 9.8 Expected annual economic damage, residential and commercial properties (£ millions) for all UK, 2080s – intra-urban flooding

Present day	World Markets	National Enterprise	Local Stewardship	Global Sustainability
270	7,880	5,055	740	1,870

Table 2.4b National ranking of catchment-scale drivers – 2080s

	World Markets	National Enterprise	Local Stewardship	Global Sustainability
	2080s	2080s	2080s	2080s
1	Social Impacts	Relative Sea Level Rise	Social Impacts	Environmental Regulation
2	Relative Sea Level Rise	Infrastructure Impacts	Relative Sea Level Rise	Relative Sea Level Rise
3	Surges	Surges	Environmental Regulation	Vegetation and Conveyance
4	Infrastructure Impacts	Buildings and Contents	Surges	Social Impacts
5	Buildings and Contents	Coastal Morphology and Sediment Supply	Precipitation	Precipitation
6	Coastal Morphology and Sediment Supply	Social Impacts	River Morphology and Sediment Supply	River Morphology and Sediment Supply
7	Waves	Precipitation	Coastal Morphology and Sediment Supply	Buildings and Contents
8	Precipitation	Urbanisation	Waves	Infrastructure Impacts
9	Stakeholder Behaviour	Waves	Vegetation and Conveyance	Coastal Morphology and Sediment Supply
10	Urbanisation	Urban Impacts	Urban Impacts	Surges
11	Urban Impacts	Rural land Management	Temperature	Urban Impacts
12	Rural land Management	Vegetation and Conveyance	Agriculture Impacts	Waves
13	River Morphology and Sediment Supply	Environmental regulation	Infrastructure Impacts	Temperature
14	Vegetation and Conveyance	River Morphology and Sediment Supply	Buildings and Contents	Agricultural Impacts
15	Temperature	Temperature	Urbanisation	Rural land Management
16	Agriculture Impacts	Agriculture Impacts	Rural land Management	Urbanisation
17	Environmental Regulation	Stakeholder Behaviour	Stakeholder Behaviour	Stakeholder Behaviour
	Science and Technology – known to be important but not quantified			
	Public Attitudes and Expectations – known to be important but not quantified			

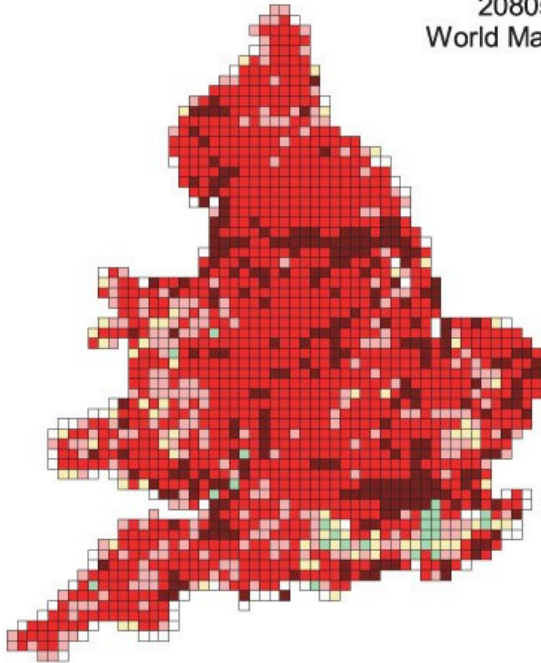
What's causing these rises in future flood risk?

Baseline ranking of catchment-scale drivers

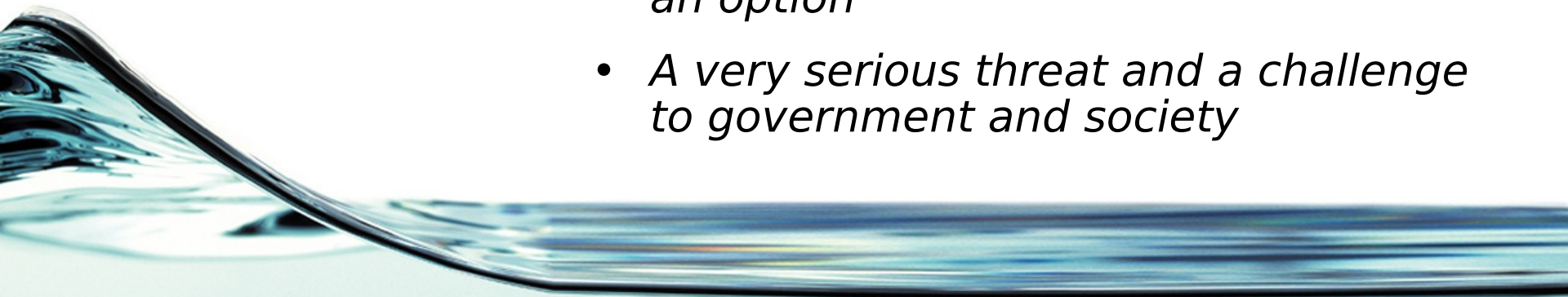
- Climate change
- Coastal drivers
- Socio-economic drivers
- Big scenario differences

Key findings of the drivers analysis

2080s
World Markets



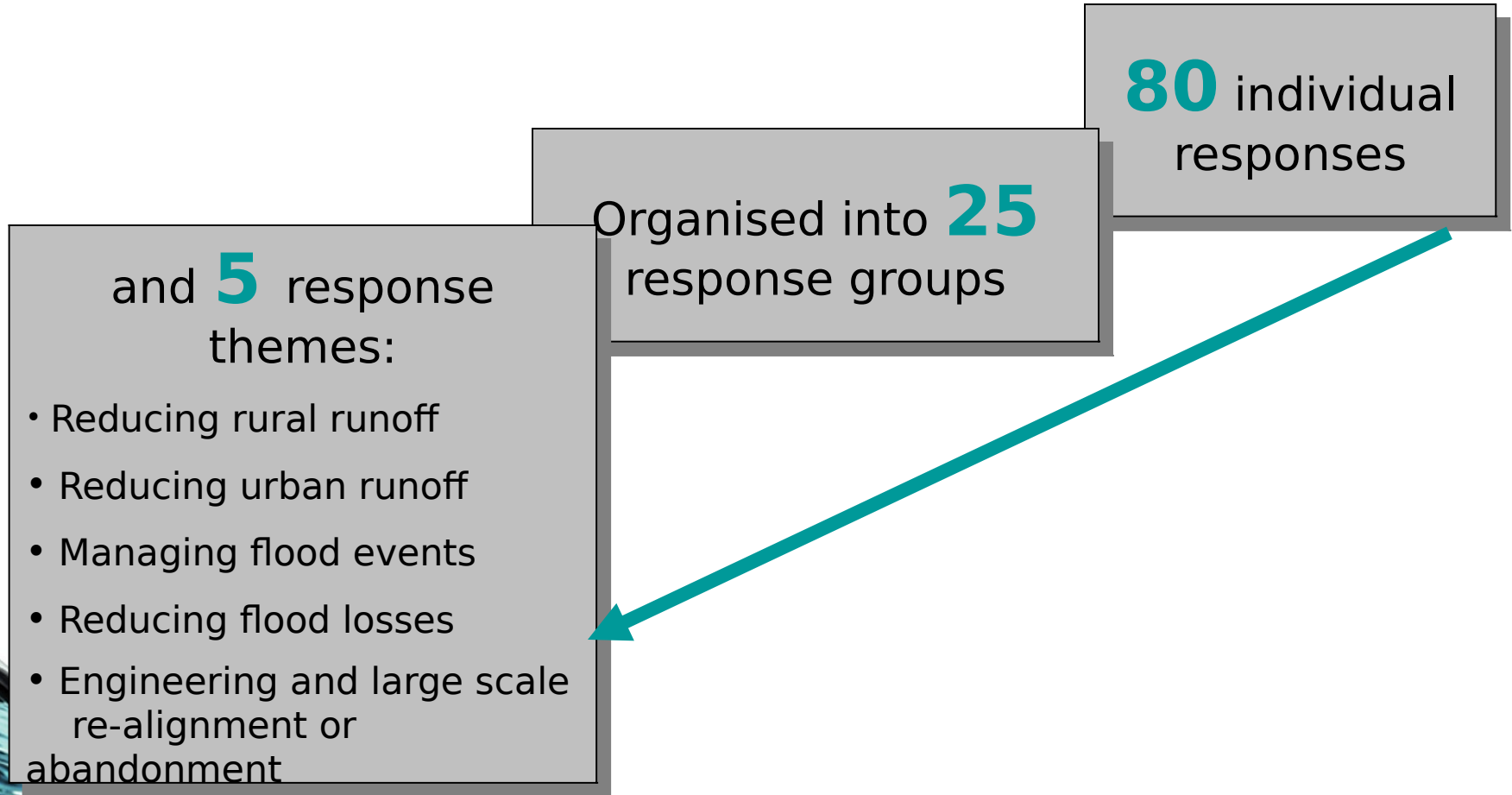
- *Flood risk grows to unacceptable levels in 3 of the 4 scenarios considered*
- *From both climate change and socio-economic drivers*
- *'Intra-urban' flood risk is confused in governance terms and a lot less quantifiable*
- *Continuing with existing policies is not an option*
- *A very serious threat and a challenge to government and society*



Assessing responses to future risk



Individual Responses



We can hold flood risk down around present day levels

Scope for reducing risk further under GS

Table 9.4 Integrated portfolios of flood management – catchment and coastal					
	Present day	World Markets	National Enterprise	Local Stewardship	Global Sustainability
Target standards of flood protection, relative to present day	1	2	2	0.75	1
Residual risks with integrated portfolio, EAD (£m/year)		1,760	1,030	930	2,040
Risk reduction, EAD (£m/year)		18,700	14,000	570	2,820

Sustainability Analysis – how the responses fared

	Number of infractions			
Sustainability metric	World Markets	National Enterprise	Local Stewardship	Global Sustainability
Cost effectiveness	3	2	1	1
Environmental quality	5	5	2	1
Social justice	12	14	2	0
Precaution	6	8	5	0
Robustness across scenarios	5	5	5	5

“It was not, however, so much the response that was the issue but rather the way that it was implemented.”

How important are managing climate change and Engineering ?

- Combining the World Markets and Low emissions scenarios could reduce economic damages by 25%.
- Engineering only might cost 2X to get the same risk reduction.
- But we can't do without it either, so:
- Integrated flood-risk management must lie at the core of our response.



Key messages from the Responses analysis

- *Flood risk can be held at present day levels using a broad portfolio of responses*
- *This could cost UK an extra £20bn to 80bn over the next 80 years. This means 2 to 4x the 2004 annual investment level*
- *No emerging responses score well across all scenarios in terms of flood risk reduction and sustainability*
- *Most concerns relate to the way that flood responses are implemented ; sustainability and governance are important*
- *We should not eliminate responses but rather aim at producing balanced portfolios that deliver flood risk reduction and sustainability*

Strategic choices for future flood management:

Where do we want to go?



How much will it cost?

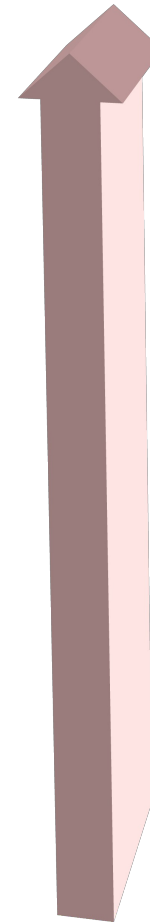
**EAD about
£1billion/year
in 2004 in UK**

Integrated portfolios of flood management – catchment and coastal					
	Present day	World Markets	National Enterprise	Local Stewardship	Global Sustainability
Target standards of flood protection, relative to present day	1	2	2	0.75	1
Residual risks with integrated portfolio, EAD (£m/year)		1,760	1,030	930	2,040
Risk reduction, EAD (£m/year)		18,700	14,000	570	2,820
Flood-management capital costs: England and Wales, fluvial and coastal (£m/year)		75,600	77,200	22,100	22,400
Additional annual capital costs to achieve risk reduction (£m/year)		1,600	1,600	500	500

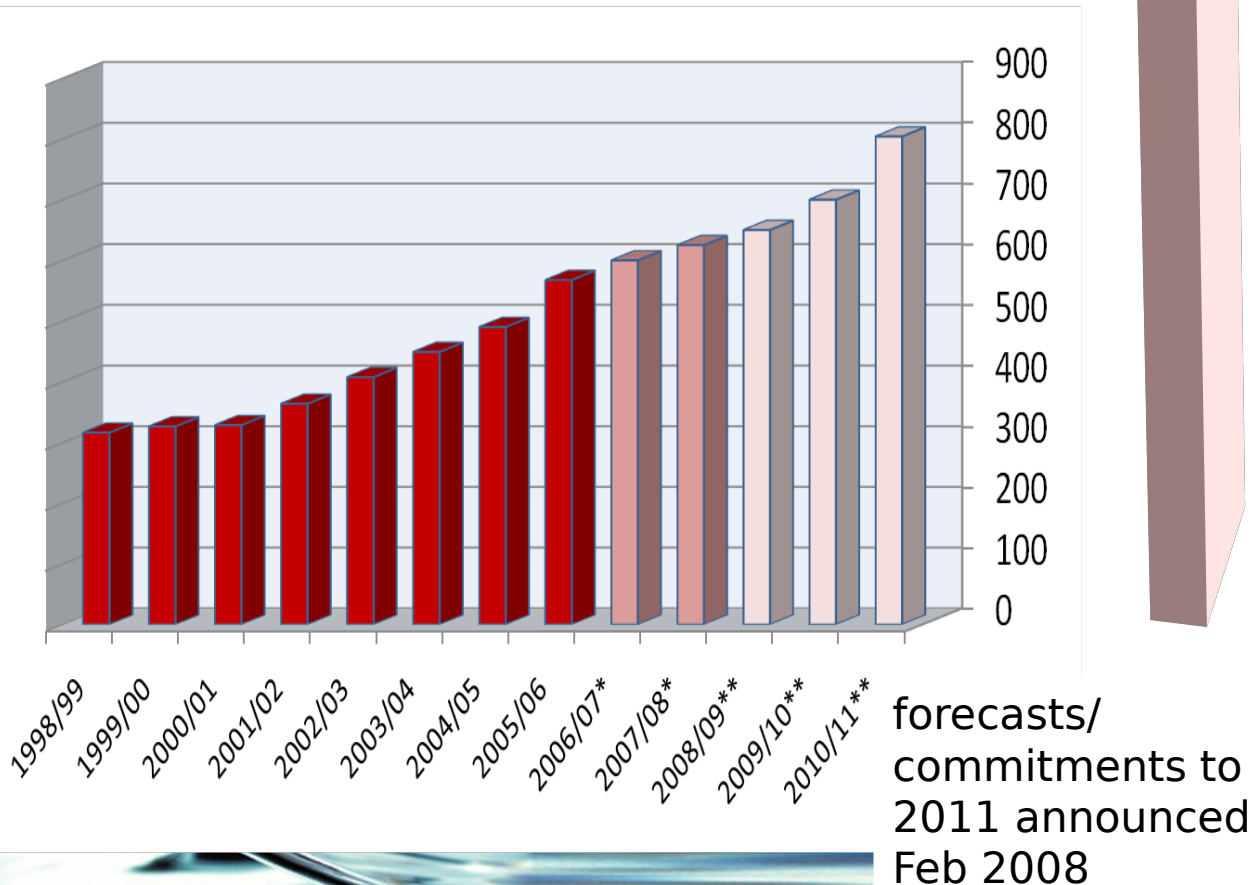
**UK capital
expenditure
about £500
million/year in
2004**

Flood risk management budget for England: 1998 to 2011 (£m per annum)

Future Flooding



Future costs
£1bn - £2bn
per annum



“Defra’s Director of Water also told us that the Foresight Report (2004)—which recommended about £1 billion per annum be spent on flood risk management by 2015 in real terms—had been “heavily influential” in the outcome of the (Treasury 2007 spending review)”

House of Commons Environment, Food and Rural Affairs Committee, 2008



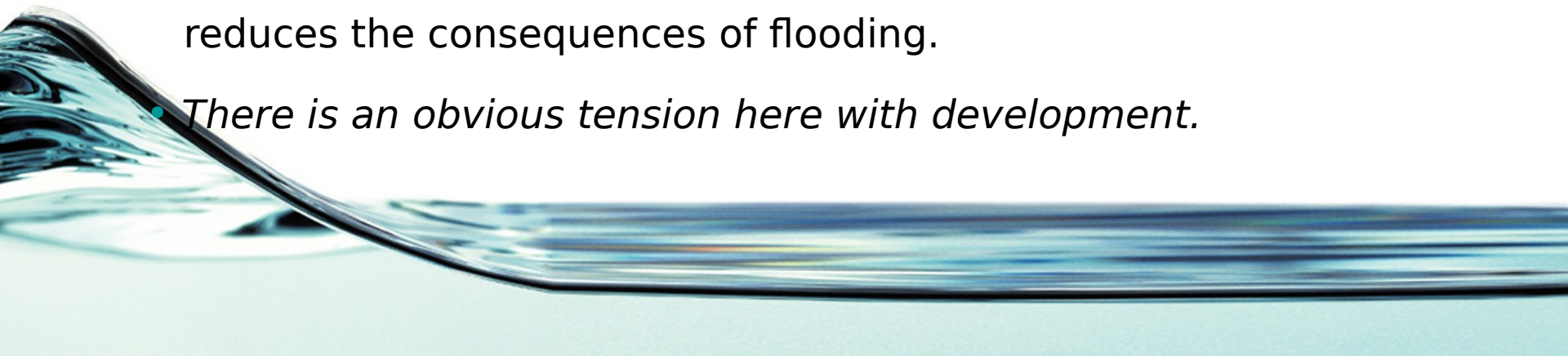
Strategic choices for future flood management:

How do we get there?



Targeting the most sustainable responses:

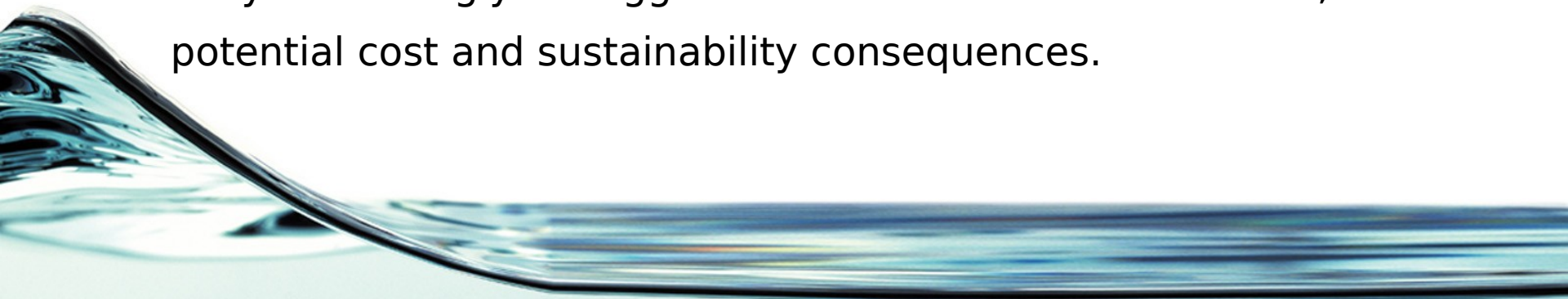
- Targeting pathways near source through, for example, catchment management storage, reduces the probability of flooding downstream.
- *However, the science underpinning the rural rainfall-runoff relationship is uncertain.*
- Targeting receptors, especially through land-use planning, reduces the consequences of flooding.
- *There is an obvious tension here with development.*



The time horizon of responses

Choices for responses that have a long lead time:

- To implement societal responses with a long lead time sooner rather than later. This is a precautionary approach to the increase in flood risk, or
- Rely increasingly on bigger structural flood defences later, with potential cost and sustainability consequences.



Adaptable, reversible and irreversible responses

Choices for managing uncertainty in future flood risk:

- To favour reversible options; and
- To favour responses that have high adaptive capacity and allow incremental enhancements; or
- To face irreversible adverse consequences for flood management.



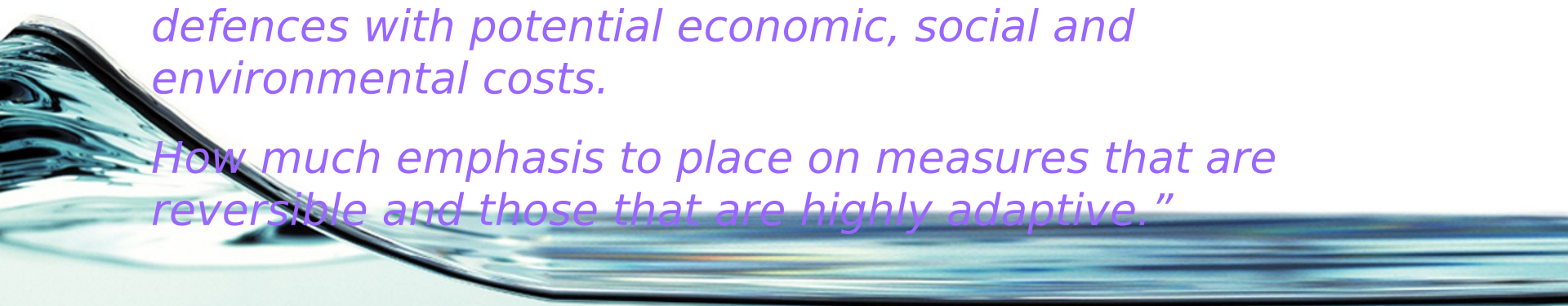
Summing up, building a portfolio of responses

“How we use land, balancing the wider economic, environmental and social needs against creating a legacy of flood risk.

How we manage the balance between state and market forces in decisions on land use.

Whether to implement societal responses with a longer lead time; or rely increasingly on bigger structural flood defences with potential economic, social and environmental costs.

How much emphasis to place on measures that are reversible and those that are highly adaptive.”



Governance messages

“There is no single response that will reduce flood risk substantially and that is completely sustainable.

Different response measures will vary under different scenarios, and the Government therefore needs to support the concept of a portfolio of responses to flood risk, which including both structural and non-structural solutions.

The Government will also need to take into account social justice implications.”



Final messages

- *Flood risk is set to increase under all scenarios, through climate, economic and governance drivers*
- *We can make it easier or harder for ourselves by our actions on global emissions and national governance.*
- *There are potentially affordable and sustainable portfolios of responses, with which we can pull back risk to present day levels*
- *We will still need to double or quadruple the current annual spend on FRM*
- *We need to plan now for future risks, and develop our policies, science and skills.*

